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ABSTRACT

The ability to successfully conduct specialized conversations in stressful situations is an essential part of professional competence in a number of subject areas; however, there are few opportunities for students to practice the required skills in a realistic environment. The McGill Negotiation Simulator project was established to investigate the use of interactive video to simulate specialized conversations. A series of increasingly challenging conversations with the same person on the same subject was created by adding new facts to the situation under discussion in the first conversation. High resolution, full screen, full motion video was used. Maximizing realism may not always maximize the learning experience; however, it seems to augment student concentration. The disadvantage of high resolution, full screen, full motion video is hardware cost. The first series of three simulations included a sales negotiation in which the student represents an aircraft manufacturer trying to sell a commuter aircraft to the vice president of a major airline. There were problems on two levels. Conceptually, it was questioned whether simulating a person was possible, given the complexity of human communication and behavior. On the implementation level, the question was whether the student would have the feeling of carrying on a conversation with a real person; another problem was video time consumed while the student chose what to say from a menu. It can be concluded that it is possible to create realistic, involving and challenging simulated conversations for use by students practicing specialized conversational skills; while these have a number of advantages over role-playing exercises, they do not replace them. (AEF)

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Simulated Conversations: The McGill Negotiation Simulator

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Abstract: The ability to successfully conduct specialized conversations in stressful situations is an essential part of professional competence in a number of subject areas, but there are few opportunities for students to practice the required skills in a realistic environment. The McGill Negotiation Simulator is an interactive full motion video project with the objective of providing realistic, involving and challenging simulated conversations between the student and someone who appears on the computer screen. The Simulator is described and the degree of realism is discussed. The conceptual and implementation problems encountered in its development are related and there is a brief summary of the advantages and disadvantages of working with consultants.

The Need for Simulated Conversations

The ability to successfully conduct specialized conversations in stressful situations is an essential part of professional competence in a number of subject areas. The purpose of the conversations may involve imparting or eliciting information, establishing a personal relationship, persuading, or a combination of these and other elements. Specialized conversations are central to a wide range of subject areas including, for example, the health and social sciences, management, education, religion and anthropology.

In most of these subject areas students are given formal instruction in conducting specialized conversations. This often includes observing conversations conducted by others either in person or on videotape. Students may also have the opportunity to engage in role-play exercises with other students followed by supervised practice in the field although frequently the former is less than realistic and the latter is difficult to arrange. In both cases, the instructor has very little control over the nature of the experience.

In 1990 the McGill Negotiation Simulator project was established to investigate using interactive video to simulate these types of specialized conversations. The idea was to offer a new and different experience to the student rather then to replace the existing use of role-play exercises and supervised practice in the field. One advantage of a simulated conversation is that it can be repeated a number of times so that the student can experiment with different strategies for handling the same situation. A conversation can be replayed exactly as it took place with feedback to the student on each choice which was made.

To maximize the usefulness of the Simulator, it was decided to create a series of increasingly challenging conversations with the same person on the same subject by adding new facts to the situation under discussion in the first conversation. Insofar as the student has already learned the basic facts of the situation, less time is needed to prepare for the new conversation.

Creating a Realistic Simulation

In a simulated conversation, someone appears on the computer screen and speaks directly to the student as shown in Figure 1. The student replies by choosing what to say from a menu which appears on the screen as shown in Figure 2. Unlike a role-play exercise, the student cannot say anything he or she wishes. On the other

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Figure 1. Speaking directly to the student

Figure 2. Choosing a reply from the menu

hand, the instructor has complete control over the person who appears on screen.

The degree of realism required is open to debate. It has been suggested that the required level of fidelity in simulations is directly related to the level of expertise of the student (Alessi, 1988; Garhart, 1991). As the student's knowledge level increases, higher fidelity simulations are required.

Maximizing realism may not always maximize the learning experience. For example, we were initially very concerned about the fact that the student chooses what to say from a menu rather than being free to say anything at all. However in practice this seems to force the student to concentrate on the matter at hand and on choosing when and how to use the skills which we are trying to teach. In role-play exercises, it is much easier for students to forget about some of the skills altogether or fill whatever time is available with idle conversation.

In this case, it was decided to maximize fidelity by using high resolution, full screen, full motion video for two reasons. First, the final and most challenging conversation in the series would presumably require the highest level of fidelity. Second, there was considerable doubt that the simulations would turn out to be sufficiently realistic even with the best video quality so there was great reluctance to settle for something less.

Full screen video has the advantage of removing distractions from the screen and focusing the student's attention on the person speaking. Realism is enhanced by always keeping the person on screen. After speaking, he or she waits for an answer rather than disappearing. This is what happens in a real conversation. The other person sits there waiting for a reply.

The obvious disadvantage of high resolution, full screen, full motion video is hardware cost. Although the cost of hardware with this capability is likely to decrease rapidly over the next few years, it currently makes little sense to create expensive simulations in subject areas where potential users cannot afford to use them.

The teaching of negotiation skills is an important component of both graduate management courses in universities and executive training courses in major corporations. In real life, negotiations are often conducted in a high stress environment where the cost of negotiation mistakes can be considerable. Although the hardware for a negotiation simulation may be expensive, it can result in cost effective training.

Hardware and Software

The choice of *TenCore Language Authoring System*, from Computer Teaching Corporation, as the authoring software was made on the basis of recommendations from authors in other university audiovisual centres. Its main advantages are its high degree of flexibility and its extensive debugging features. The latter have proved invaluable in tracking down the author's frequent bumbling in the middle of very complex code. *TenCore* supports a wide range of hardware for the PC platform including both videodisc players and DVI. A lot of time was spent evaluating *DVI* and other forms of compressed video on CD-ROM before concluding that they cannot yet meet our requirements.

In discussing the Simulator with potential users at other institutions, its ability to run unattended was frequently questioned. What if someone puts in the wrong disc? What if there is a power failure? What if a student plays around and manages to delete files? The latter problem is the most serious and was solved by locking away the keyboard. Everything can be controlled by using the mouse.

Solving some of the other problems necessitated learning in detail how video overlay boards work and how videodisc players are controlled. Although *TenCore* has a driver for each overlay board that it supports, it also allows the author to communicate directly with the board. This turned out to be very important since authoring language board drivers generally support only one video mode and a subset of board commands. For example, we wished to have a user code recorded on our videodiscs which could be read by the program to ensure that the student has the right videodisc in the player. It turned out to be surprisingly difficult to get full information on how user codes work and how particular players read them.

Major Problems Encountered

It was decided that the first series of three simulations would involve a sales negotiation in which the student represents an aircraft manufacturer and is trying to sell a commuter aircraft to the Vice-President of a major airline. There were problems on two different levels. On the conceptual level, the question was whether simulating a person was possible given the incredible complexity of human communication. Further, how could we be sure that this person would behave as most executives would in similar circumstances? In addition, what assumptions were we making in deciding on the correct way for the student to respond during the negotiation?

On the implementation level, the question was whether the student would have the feeling of carrying on a conversation with a real person or a stilted exchange with a cartoon character generated by a machine. If the person would remain on screen while the student chose what to say from a menu, how could this be accomplished without using vast quantities of video time?

Conceptual Problems

Most simulations model a process which is well understood and predictable. Whether the process involves the control of equipment or other resources, the authors of the simulation can be confident that they know what would happen for any course of action taken by the student. Moreover, there is a right and a wrong way of proceeding in any given circumstances.

As authors we might have our own ideas of how an average executive would respond in a particular negotiation situation, but human beings are by nature unpredictable. On top of that, negotiation is not an exact science. Although a particular course of action may clearly be a mistake in a given situation, there is likely to be more than one good way to proceed. What might work well in negotiating with one person could fail if used with someone else.

The key to simulating conversations is to realize that you are simulating a particular person on a particular day. He or she might react differently tomorrow. In fact you may wish to have a different version of the same simulation which the student can try tomorrow. Once you realize that there is no such thing as a universally "correct" person, the burden of simulating such a person is removed.

In many subject areas there are multiple approaches or conflicting views on the topic. Students are encouraged to develop their own views by reading and comparing what different authors have to say on the subject. The same thing will occur when negotiation simulations become more commonplace. Students will try our simulations and then compare them to those of other authors.

Insofar as our simulation involved the student choosing what to say from a menu of up to four choices, we decided to frequently have more than one good choice on the menu. Thus there are several different paths to a successful outcome. By allowing students to try the simulation more than once, they can explore different approaches to the same situation whether or not they have done well on the first try.

Implementation Problems

Full motion video is a precious commodity and we could not have long sequences which show the person on screen waiting for the student to choose what to say from a menu. A new technique was therefore devised to create the illusion that the person on screen is sitting there waiting for a reply without actually showing the person. The technique involves seating the executive who appears on screen behind a desk and having him look directly at the camera. After the executive speaks to the student, the menu appears as a horizontal band across the middle of the image. This hides the executive, but leaves visible the desk below the menu and the background of the room above the menu. It creates the illusion that the executive is just behind the menu waiting for the student's response. As soon as the student makes a dialogue choice, the menu disappears and the executive responds appropriately.

A sample videodisc sequence was produced early in the development process and testing on a small number of students quickly revealed that the technique creates a very involving simulation. Further experiments have indicated that several factors greatly enhance the illusion of a real conversation.

It is important that the background image of the room does not disappear or change at any point during the conversation. Otherwise the seamless interaction is broken and the mechanics of the system intervene. We therefore use an overlay card which has a framestore. When the executive finishes speaking, we put up the menu to hide him and then freeze the background using the framestore. When the student makes a dialogue choice, we first find the appropriate response sequence on the videodisc and begin playing it, then we release the framestore as the menu disappears. To avoid a jump in the image of the room at that point, it is important that all of the sequences be shot with exactly the same framing. This requires great care in avoiding any movement of the camera during shooting.

Although the video is frozen while the student makes a dialogue choice from the menu, the audio is not. The audio consists of background office sounds. If the student does nothing for a few minutes, there is the sound of the person behind the menu shuffling his papers and then coughing. This audio is recorded on the videodisc's second audio track. If the student still does nothing, the program switches to a video sequence. The menu is left on screen to hide the person, but his hand reaches forward under the menu and he drums his fingers on the table.

Another important factor in maintaining a seamless interaction is to ensure that the person on screen responds quickly to the student's dialogue choice as he or she would in real life. Quick response time is dependent upon the layout of the videodisc and the search speed of the videodisc player. By using a videodisc player with a maximum search time of two seconds, we can ensure a response time of about one quarter of a second through careful videodisc layout. This is the time required to get the appropriate sequence running and remove the menu. We have discovered that the student then needs time to focus on the image of the executive before being able to concentrate on what he is saying. Each sequence is therefore shot so that the executive pauses for one second before beginning to speak.

Pedagogical Objectives and the Topic of Conversation

The purpose of a simulated conversation is to enable the student to practice specific skills. Although the student must use more than one skill at any particular point in the conversation, we believe that it is important to focus on one skill at a time in order to maximize learning. It is similar to physical exercise where a particular exercise requires the use of a number of muscles, but there is a focus on the muscle which does the bulk of the work.

Insofar as the conversation would cover a number of topics, we decided to associate a particular negotiation skill with each topic of conversation. The dialogue choices available to the student focus on the use of that skill. The instructor can control whether the negotiation skill is communicated to the student at the beginning of each topic and whether there is a help button available to assist the student in evaluating each dialogue choice with reference to that skill. The instructor can also determine whether the student must cover all of the topics in a predetermined order or whether the student can cover the topics in any order and leave topics out. If the student does not choose, or is not allowed, to change the topic, the executive on screen will change the topic as he sees

fit and bring up topics which the student would rather not discuss. In real life there are usually topics which are best avoided and the skill associated with discussing them involves extricating oneself as quickly as possible.

We tried a number of ways of allowing the student to change the topic of conversation. Initially we allowed the student to change the topic at any time. This was chaotic and not very realistic. In a real conversation, there are specific points where a change of topic might be appropriate. We have taken those points, and a few others where the student might be looking for a way out of serious trouble, and provided a dialogue choice which leads to a submenu containing the topics which have not yet been discussed. The student can then choose one of these topics and suggest that they move on to discuss it. The executive on screen will usually agree unless the student is in trouble and is trying to change the topic in order to avoid answering a difficult question.

Special Features Required for a Sales Negotiation

One of the topics of discussion is a price negotiation during which the student can change his or her offer and choose what to say in presenting the new offer. The person on screen then replies and may or may not make a counter-offer. The question was how to convey numerical information between the parties. In the case of the student, this turned out to be relatively simple. The student is given a dialogue choice which leads to a new offer work sheet. The student uses up and down buttons to change the price of the aircraft and then confirms that this new offer is to be submitted. New dialogue choices then appear and the student decides on how to present the offer, such as by saying, "This is the lowest I can go."

In the case of a counter-offer by the person on screen, he points to a spot to one side and makes a comment about his counter-offer, such as by saying, "I have raised my counter-offer. Now I want to see a change in your position." We use the computer to generate a card which gives the details of his counter-offer and overlay it in the spot to which he is pointing. It looks as though he is using a flip chart to convey the information.

Enhancing the Realism of the Conversational Situation

Although we have not done any objective testing to determine the relationship between the perceived realism of the simulations and the amount of learning to apply negotiation skills which takes place, we believe that students devote more effort to an exercise which they find to be both challenging and realistic. We believe that the realism of the simulations has been enhanced by using many real elements in what would otherwise be a totally fictitious negotiation situation. As the representative of ATR Aircraft, the student is trying to sell an ATR-42 commuter aircraft to Olympic Airways. Both of these are actual corporations. ATR is a major manufacturer of commuter aircraft which is jointly owned by the governments of France and Italy. Olympic Airways is the national airline of Greece which in fact uses the ATR-42. With the cooperation of the corporations involved and the Government of Greece, dramatic video material was obtained to enhance the presentation of the situation.

The student can consult additional full motion video research material before or during the negotiation session. The display of this material includes control buttons at the bottom of the screen similar to those of a

Figure 3. Doing research on the ATR-42

videocassette player as shown in Figure 3. The student can fast forward or fast rewind. There is also a "Text Mode" button which stops the video and instead displays the narration as printed text on the screen. Although students are told that they can take notes, all of the information which they are given can be repeated by using the appropriate buttons on the menus. In the limited testing so far, students have been about evenly divided in their preference for seeing the video with narration or reading printed text. Most students take very few notes. Student preferences do not appear to be indicative of their success or failure in the negotiation.

Working with Consultants

It would make little sense to devote so much time and money to developing a simulation which could only be used by its principal authors. Early in the development process, a test sequence was shown at a conference on negotiation skills. Its favourable reception led to the recruitment of consultants who teach negotiation skills at seven universities in the United States and Canada. These consultants have been an important factor.

We did not anticipate how much the consultation process would lengthen the development schedule. Flow diagrams which document the simulation are complex and the authors had developed a shorthand method of discussing what should happen at any particular spot. When these flow diagrams were sent to consultants, long written explanations had to be prepared which clarified what each diagram was about and how it fitted into the whole negotiation session.

On the other hand, the usefulness of the simulator improved dramatically as a result of comments made by the consultants. Teaching styles vary widely and the requirements listed by the consultants were sometimes mutually exclusive. A list of parameters was therefore developed which could be set by the instructor in advance to customize the simulation. For example, one parameter controls whether the person on screen will end the meeting and walk out if the student irritates him sufficiently. Although these parameters increases the complexity of the programming, they maximize the flexibility of the Simulator.

Conclusion

It is possible to create realistic, involving and challenging simulated conversations which can be used by students to practice specialized conversational skills. While these have a number of advantages over role-play exercises, they do not replace them. Although the degree of realism required in the simulation is open to debate, every effort has been made to maximize realism by using full screen full motion video and a situation based on actual places and corporations. There has been no attempt to create a universally "accurate" or "correct" person on screen. The student deals with a particular person on a particular day.

A separate conversational skill is associated with each topic of conversation to help the student focus on using that particular skill. Techniques have been developed to enable the student to change the topic of conversation, to allow the parties to exchange financial information and to create the impression that the person on screen is always present waiting for the student's response. Although the use of consultants has lengthened the production schedule, it has resulted in a much more flexible simulation through the development of parameters which can be set by the instructor.

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